

$$\begin{cases} {}^n\mathbb{C}_n^{\mathbb{C}} \\ {}^n\mathbb{H}_n^{\mathbb{C}} \end{cases} = \begin{cases} \Gamma \in {}^n\mathbb{C}_n^{\mathbb{C}} & \Gamma \Gamma^T = \begin{array}{c|c} 1 & 0 \\ 0 & 1 \end{array} \\ \Gamma \in {}^n\mathbb{H}_n^{\mathbb{C}} & \Gamma \begin{array}{c|c} i & 0 \\ 0 & i \end{array} \Gamma^* = \begin{array}{c|c} i & 0 \\ 0 & i \end{array} \end{cases}$$

$$\sigma:\tau \in \mathbb{C}^U \Rightarrow \begin{array}{c|cc} \kappa & -i \\ \hline -i & \kappa \end{array} \begin{array}{c|cc} \bar{\sigma} & 0 \\ \hline 0 & \bar{\tau} \end{array} {}^n\mathbb{H}_n^{\mathbb{C}} \frac{\sigma}{\mathbb{C}^n} \begin{array}{c|cc} 0 & 0 \\ \hline \tau & \end{array} \begin{array}{c|cc} \kappa & i \\ \hline i & \kappa \end{array}_{\text{unit}} = {}^n\mathbb{H}_n^{\mathbb{C}} \cap {}^n\mathbb{C}_n^{\mathbb{C}} \xrightarrow{\begin{array}{c|cc} 0 & \mathfrak{k} \\ \hline -\mathfrak{k} & 0 \end{array}} {}^n\mathbb{C}_n^{\mathbb{C}}$$

$$\begin{aligned} \Gamma \in {}^n\mathbb{H}_n^{\mathbb{C}} &\Rightarrow \begin{array}{c|cc} \kappa\bar{\sigma} & -i\bar{\tau} \\ \hline -i\bar{\sigma} & \kappa\bar{\tau} \end{array} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} \kappa\sigma & i\sigma \\ \hline i\tau & \kappa\tau \end{array} \overbrace{\begin{array}{c|cc} \kappa\bar{\sigma} & -i\bar{\tau} \\ \hline -i\bar{\sigma} & \kappa\bar{\tau} \end{array}}^t \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} \kappa\sigma & i\sigma \\ \hline i\tau & \kappa\tau \end{array} \\ &= \begin{array}{c|cc} \kappa\bar{\sigma} & -i\bar{\tau} \\ \hline -i\bar{\sigma} & \kappa\bar{\tau} \end{array} \stackrel{\mathbb{C}}{\Gamma} \underbrace{\begin{array}{c|cc} \kappa\sigma & i\sigma & \kappa\sigma & i\tau \\ \hline i\tau & \kappa\tau & \sigma i & \kappa\tau \end{array}}_{\begin{array}{c|cc} 0 & \kappa i\sigma\tau \\ \hline \kappa i\sigma\tau & 0 \end{array}} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} \kappa\sigma & i\sigma \\ \hline i\tau & \kappa\tau \end{array} \\ &= \begin{array}{c|cc} \kappa\bar{\sigma} & -i\bar{\tau} \\ \hline -i\bar{\sigma} & \kappa\bar{\tau} \end{array} \underbrace{\begin{array}{c|cc} \kappa i\sigma\tau & 0 \\ \hline 0 & \kappa i\sigma\tau \end{array}}_{\begin{array}{c|cc} 1 & 0 \\ \hline -1 & 0 \end{array}} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} 1 & 0 \\ \hline 0 & -1 \end{array} \underbrace{\begin{array}{c|cc} 0 & 1 \\ \hline -1 & 0 \end{array}}_{\begin{array}{c|cc} 0 & 1 \\ \hline -1 & 0 \end{array}} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} \kappa\sigma & i\sigma \\ \hline i\tau & \kappa\tau \end{array} \\ &= \begin{array}{c|cc} i\tau & \kappa\sigma \\ \hline \kappa\tau & i\sigma \end{array} \underbrace{\begin{array}{c|cc} 1 & 0 \\ \hline 0 & -1 \end{array}}_{\begin{array}{c|cc} 1 & 0 \\ \hline 0 & -1 \end{array}} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} 0 & 1 \\ \hline -1 & 0 \end{array} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} 1 & 0 \\ \hline 0 & -1 \end{array} \stackrel{\mathbb{C}}{\Gamma} \begin{array}{c|cc} \kappa\sigma & i\sigma \\ \hline i\tau & \kappa\tau \end{array} = \begin{array}{c|cc} 1 & 0 \\ \hline 0 & 1 \end{array} \end{aligned}$$

$$\begin{cases} {}^n\mathbb{H}_n^{\mathbb{C}} * \begin{array}{c|cc} 0 & \mathfrak{k} \\ \hline -\mathfrak{k} & 0 \end{array} = 0 \\ \begin{array}{c|cc} \kappa\bar{\sigma} & -i\bar{\tau} \\ \hline -i\bar{\sigma} & \kappa\bar{\tau} \end{array} \begin{array}{c|cc} 0 & \mathfrak{k} \\ \hline -\mathfrak{k} & 0 \end{array} \begin{array}{c|cc} \kappa\sigma & i\sigma \\ \hline i\tau & \kappa\tau \end{array} = \bar{\sigma}\bar{\tau} \begin{array}{c|cc} 0 & \mathfrak{k} \\ \hline -\mathfrak{k} & 0 \end{array} \end{cases} \Rightarrow \begin{array}{c|cc} \kappa\bar{\sigma} & -i\bar{\tau} \\ \hline -i\bar{\sigma} & \kappa\bar{\tau} \end{array} {}^n\mathbb{H}_n^{\mathbb{C}} \frac{\kappa\sigma}{i\tau} \begin{array}{c|cc} i\sigma & \mathfrak{k} \\ \hline -\mathfrak{k} & 0 \end{array} * \begin{array}{c|cc} 0 & \mathfrak{k} \\ \hline -\mathfrak{k} & 0 \end{array} = 0$$

$$\frac{\begin{array}{c|cc} \varepsilon & ij \\ -\varepsilon j & \varepsilon i \end{array}}{\begin{array}{c|cc} \bar{\alpha} & i\bar{\alpha} \\ \bar{\beta} & -\bar{\beta}i \end{array}} \xrightarrow[n]{2\mathbb{C}_n} \frac{\begin{array}{c|cc} \alpha & \beta \\ -\alpha i & \beta i \end{array}}{\text{unit}} \xrightarrow[n]{2\mathbb{H}_n} \frac{\begin{array}{c|cc} \varepsilon & j \\ ji & -\varepsilon i \end{array}}{\text{unit}} \xrightarrow{\begin{array}{c|cc} j & 0 \\ 0 & j \end{array}}$$

$$\sigma:\tau \in \mathbb{C}^U \Rightarrow \frac{\kappa\varepsilon}{-\kappa j} \begin{vmatrix} ij \\ \varepsilon i \end{vmatrix} \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \begin{vmatrix} i\bar{\alpha} \\ -\bar{\beta}i \end{vmatrix} \begin{vmatrix} i \\ 0 \end{vmatrix} \begin{vmatrix} 0 \\ i \end{vmatrix} = \frac{-\kappa\varepsilon\alpha\beta j}{0} \begin{vmatrix} 0 \\ -\kappa\varepsilon\alpha\beta j \end{vmatrix} \frac{\kappa\varepsilon}{-\kappa j} \begin{vmatrix} ij \\ \varepsilon i \end{vmatrix} \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \begin{vmatrix} i\bar{\alpha} \\ -\bar{\beta}i \end{vmatrix}$$

$$\Gamma \in {}_2^n\mathbb{C}_n^{\mathbb{C}} \Rightarrow$$

$$\frac{\kappa\varepsilon}{-\kappa j} \left| \begin{array}{c} ij \\ \varepsilon i \end{array} \right. \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \left| \begin{array}{c} i\bar{\alpha} \\ -\bar{\beta}i \end{array} \right. \Gamma \frac{\kappa\alpha}{-\alpha i} \left| \begin{array}{c} \kappa\beta \\ \beta i \end{array} \right. \frac{\kappa\varepsilon}{ji} \left| \begin{array}{c} \kappa j \\ -\varepsilon i \end{array} \right. 0 \left| \begin{array}{c} 0 \\ i \end{array} \right. \overbrace{\frac{\kappa\varepsilon}{-\kappa j} \left| \begin{array}{c} ij \\ \varepsilon i \end{array} \right. \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \left| \begin{array}{c} i\bar{\alpha} \\ -\bar{\beta}i \end{array} \right. \Gamma \frac{\kappa\alpha}{-\alpha i} \left| \begin{array}{c} \kappa\beta \\ \beta i \end{array} \right. \frac{\kappa\varepsilon}{ji} \left| \begin{array}{c} \kappa j \\ -\varepsilon i \end{array} \right.}^*$$

$$= \frac{\kappa\varepsilon}{-\kappa j} \begin{array}{c|c} ij \\ \hline -\varepsilon i \end{array} \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \begin{array}{c|c} i\bar{\alpha} \\ \hline -\bar{\beta}i \end{array} \underbrace{\Gamma \frac{\kappa\alpha}{-\alpha i} \begin{array}{c|c} \kappa\beta \\ \hline \beta i \end{array} \frac{\kappa\varepsilon}{ji} \begin{array}{c|c} \kappa j \\ \hline -\varepsilon i \end{array} \frac{i}{0} \begin{array}{c|c} 0 \\ \hline i \end{array} \frac{\kappa\varepsilon}{-\kappa j} \begin{array}{c|c} ij \\ \hline \varepsilon i \end{array} \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \begin{array}{c|c} i\bar{\alpha} \\ \hline -\bar{\beta}i \end{array}}_{= \frac{-\kappa\varepsilon\alpha\beta j}{0} \begin{array}{c|c} 0 \\ \hline -\kappa\varepsilon\alpha\beta j \end{array}} \Gamma^* \frac{\kappa\alpha}{-\alpha i} \begin{array}{c|c} \kappa\beta \\ \hline \beta i \end{array} \frac{\kappa\varepsilon}{ji} \begin{array}{c|c} \kappa j \\ \hline -\varepsilon i \end{array}$$

$$= \frac{\kappa\varepsilon}{-\kappa j} \begin{array}{|c} ij \\ \hline \varepsilon i \end{array} \frac{\kappa\bar{\alpha}}{\kappa\bar{\beta}} \begin{array}{|c} i\bar{\alpha} \\ \hline -\bar{\beta}i \end{array} \Gamma \frac{-\kappa\varepsilon\alpha\beta}{0} \begin{array}{|c} 0 \\ \hline -\kappa\varepsilon\alpha\beta \end{array} \frac{j}{0} \begin{array}{|c} 0 \\ \hline j \end{array} \Gamma^* \frac{\kappa\alpha}{-\alpha i} \begin{array}{|c} \kappa\beta \\ \hline \beta i \end{array} \frac{\kappa\varepsilon}{ji} \begin{array}{|c} \kappa j \\ \hline -\varepsilon i \end{array}$$

$$= \frac{\varepsilon}{-\varepsilon j} \begin{array}{c|c} ij & \\ \hline -\varepsilon j & \varepsilon i \end{array} \begin{array}{c|c} i\bar{\alpha} & i\bar{\alpha} \\ \hline \varepsilon\bar{\beta} & -\bar{\beta}i \end{array} \begin{array}{c|c} -\varepsilon\alpha\beta & 0 \\ \hline 0 & -\varepsilon\alpha\beta \end{array} = \underbrace{\begin{array}{c|c} \Gamma & t \\ \hline 1 & 0 \end{array}}_{=\frac{1}{0} \begin{array}{c|c} 0 & 1 \end{array}} \begin{array}{c|c} j & 0 \\ \hline 0 & j \end{array} \begin{array}{c|c} \varepsilon\alpha & \varepsilon\beta \\ \hline -\alpha i & \beta i \end{array} \begin{array}{c|c} \varepsilon\varepsilon & \varepsilon j \\ \hline ji & -\varepsilon i \end{array}$$

$$= \frac{\varepsilon}{-\varepsilon j} \begin{array}{|c} ij \\ \hline |c|c| \\ \varepsilon i & \varepsilon \bar{\beta} \end{array} \begin{array}{|c} i\bar{\alpha} \\ \hline |c|c| \\ -\bar{\beta}i & 0 \end{array} \begin{array}{|c} -\varepsilon\alpha\beta \\ \hline |c|c| \\ 0 & -\varepsilon\alpha\beta \end{array} \begin{array}{|c} 0 \\ \hline |c|c| \\ 0 & j \end{array} \begin{array}{|c} j \\ \hline |c|c| \\ 0 & j \end{array} \begin{array}{|c} \varepsilon\alpha \\ \hline |c|c| \\ -\alpha i & \beta i \end{array} \begin{array}{|c} \varepsilon\beta \\ \hline |c|c| \\ \beta i & ji \end{array} \begin{array}{|c} \varepsilon \\ \hline |c|c| \\ ji & -\varepsilon i \end{array} = \frac{i}{0} \begin{array}{|c} 0 \\ \hline |c|c| \\ 0 & i \end{array}$$

$$\sigma \in \mathbb{C}^{\vee} \Rightarrow \frac{1}{-\varkappa j} \left| \begin{array}{c} -j \\ \varkappa \end{array} \right. \frac{\bar{\varrho}}{0} \left| \begin{array}{c} 0 \\ \bar{\varrho} \end{array} \right. \frac{a}{-b} \left| \begin{array}{c} b \\ \bar{a} \end{array} \right. \frac{\varrho}{0} \left| \begin{array}{c} 0 \\ \varrho \end{array} \right. \frac{1}{j} \left| \begin{array}{c} \varkappa j \\ \varkappa \end{array} \right. \underset{\text{unit}}{=} \frac{a + bj}{0} \left| \begin{array}{c} 0 \\ \bar{a} - \bar{b}j \end{array} \right.$$

$$\frac{a}{-\bar{b}} \left| \begin{array}{c} b \\ \bar{a} \end{array} \right. \frac{\sigma}{\sigma j} \left| \begin{array}{c} \varkappa \sigma j \\ \varkappa \sigma \end{array} \right. = \frac{\sigma}{\sigma j} \left| \begin{array}{c} \varkappa \sigma j \\ \varkappa \sigma \end{array} \right. \frac{a + bj}{0} \left| \begin{array}{c} 0 \\ \bar{a} - \bar{b}j \end{array} \right.$$

$$\frac{\sigma}{\sigma j} \left| \begin{array}{c} \sigma j \tau \\ \sigma \tau \end{array} \right. \frac{a + bj}{0} \left| \begin{array}{c} 0 \\ \bar{a} - \bar{b}j \end{array} \right. \frac{\bar{\sigma}}{-\bar{\tau}j\bar{\sigma}} \left| \begin{array}{c} -j\bar{\sigma} \\ \bar{\tau}\bar{\sigma} \end{array} \right. = \frac{a}{-\bar{b}(1 + \tau^2)} \left| \begin{array}{c} b(1 + \bar{\tau}^2) \\ \bar{a} \end{array} \right.$$